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## **Understanding Seascapes Through the Eyes of Honoli‘i Surfers**



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## **Abstract**

Local stakeholders are stewards of their own coastal communities, aware of changes both socially and physically that occur in the seascape. How the landscape changes has implications for local cultural values and beliefs. To gain a better understanding of how communities change over time socially and physically, we conducted semi-structured interviews with surfers who are known as experts in the surf spot of Honoli'i Bay located in Hilo, Hawaii. Interview methods included diagrams, open-ended questions, and photographs. Within the community, we interviewed 12 surfers considered to be local experts on surf conditions to ask about their observations. The expert surfers provided a better understanding of (1) great, average, and poor surf conditions at Honoli'i, (2) changes both socially and physically over time and (3) whether the surf quality has changed over time through the eyes of someone within the community. Stories shared by the expert surfers were formed into four themes; social perceptions, sense of place, environmental changes, and changes in surf quality. The themes illustrate what has changed over time and were observed by these local watermen first-hand. Through this interview, we discovered the resiliency of the community towards social and physical changes in the seascape and the communities ability to adapt.

## **Introduction**

Seascapes encompass areas of land and sea, where streams meet the ocean and sandbeds move with the changing current. Global climate change is a major topic of concern for seascapes as climate models continue to forecast changes in sea surface temperature, rainfall, and tidal events. Over the last 30 years, the State of Hawai'i has experienced an overall decline of rainfall with predictions of more drought and a rise in sea surface temperatures (SEAGRANT 2014). Residents of Hawai'i Island have a close affinity with seascapes through popular recreational activities such as paddling, surfing, and barbeques on the beach, creating what is known as a social landscape (Wiener et al. 2015). Changes in climate will affect the social and physical landscape and the future management of coastal seascapes.

To better manage the full range of global environmental issues the world will encounter, it is vital to enlist multiple sources of knowledge. The instrument-based climate science disciplines are popular knowledge sources but fail to capture sociocultural knowledge. Climate can be understood through memory, behavior, text, and culture as much as it is measured in

meteorology (Hulmes 2008). Ocean users are observers who can “recall events precisely, describe changes accurately, and place them in appropriate social contexts” (Alessa 2015 p.1). Reconnecting culture and climate is needed to understand how people such as ocean users have been affected by climate and what measures were taken to adapt to changes in the climate.

### Surfers As Observers

My study focused on coastal community residents who are an important knowledge resource yet to be fully recognized. Coastal seascapes are areas where natural resources and social activities take place on a daily basis with connections to values and traditions to nearby natural resources. Understanding how to efficiently manage these coastal areas remains a challenge however, due to the social, biological, and physical processes that make up these areas. Recreational activities and fishing are a part of the social process while physical processes such as earthquakes and heavy rainfall directly affect the seascape. As the community residents thrive within the seascape, they become personal stakeholders and first-hand observers to any changes in the seascape (Alessa et al. 2015).

Surfers in particular are a part of coastal communities that need to be constantly aware of changes to the coastal environment to stay engaged in their activity. They are similar to oceanographers in their understanding of how parameters such as swell direction, currents, streamflow, and tidal events affect near shore waters (N. Puniwai unpublished data). Aspects of sociocultural knowledge such as personal experience and behavior are taken into account as well, in what is described as mental models. These mental models allow for recognition of how observers rationalize and make decisions, two key aspects that can be used to monitor future surf conditions (Jones et al. 2011).

There is a lack of studies focusing on utilizing surfer knowledge in understanding how climate change affects coastal communities (Clark 2014; Lazarow 2007; Walker 2014). To address this issue, I interviewed surfers at Honoli‘i beach park in Hilo, Hawai‘i to understand their mental model of what creates quality surf conditions. This model included both physical and social observations. Observation of the parameters previously discussed were asked in detail during semi-structured interviews. Afterwards, these observations were interpreted to create an understanding of how the parameters affect each surf site (Meyer 2001). Three questions were considered during the course of this research: what changes do local expert surfers observe socially and physically at Honoli‘i, does the method of inquiry influence a person’s response, and does a surfer’s interpretation of surf conditions align with those of meteorological data. These questions offer insight into how surfers understand seascapes and their perception of which variables create quality surf conditions.

#### Honoli‘i Bay Setting

Honoli‘i is well recognized by surfers as being one of the most popular surf spots in Hilo. The beach is made up of black sand and pebbles that have been carried down with freshwater from the Honoli‘i stream. Incoming swells bring consistent surf year round to several surf spots in Honoli‘i: points, mids, privates, and tombstones. A strong rip current, beginning from the stream flows around the several sites, is used by surfers to paddle their way out into the lineup. Ocean users frequent the area, with the local surfing community consisting of all ages and experience levels (Clark 2002).

Mo‘olelo (stories) tell of the social aspect, such as the natural resources families used to harvest like limu ‘ele‘ele (seaweed) and ‘ōpae (freshwater shrimp) at Honoli‘i. An excerpt of Clark’s book provides mo‘olelo from individuals who were part of the Honoli‘i community previously, telling tales of how the community was self-sufficient and lived off the land, river,

and sea. Using mo‘olelo to remind present and future coastal communities of what was possible in the past can present solutions to future challenges. Bridging the social and physical seascapes strengthens the ability for future generations to seek new solutions and better adapt to changes in climate. As described, Honoli‘i is a popular surf spot for Hilo residents not only due to the prime location but also the social activities that once took place there (Clark 2002 pp. 109). This study illustrates how surfers mentally model surfing conditions at Honoli‘i and encourages the use of local knowledge as an important resource tool for future management. By understanding a surfer’s mental model of a physical landscape, it provides an in-depth analysis of social variables that cannot be recorded quantitatively.

## **Methods**

### **Sampling strategy**

In order to understand the surfer’s mental model, individual semi-structured interviews were conducted in person with 12 surfers, ranging in age from 31 to 67 years, from June to July 2015. Only 1 was female out of the 12 interviewed. A technique called snowball sampling was utilized to find participants who the local community viewed as experts of Honoli‘i. (Thurstan et al. 2015). The community referenced included the head lifeguard of Hilo and surf shop owners. One confounding variable identified was under or over representation of a particular group not well connected to the lifeguards or surf shop owners. However, chances were extremely low considering the lack of surf sites available for surfers in Hilo. This means that most local experts at Honoli‘i would be well acquainted with the contacts we approached. The local expert surfers were chosen based on years surfed at Honoli‘i. The twenty-year mark was chosen based on Dr. Bruce Tonn who acknowledged for Western cultures, individuals personally view their future 15 years ahead (2006). The interview period ranged from half an hour to an hour depending on how

long participants would be willing to converse. The interview was recorded electronically for future transcription.

#### Interview structure

A semi-formal interview with a mix of open-ended and closed questions was conducted with participants. This interview structure allowed for a set of questions to be formed ahead of time. It also provided participants the opportunity to express their opinions in their own personal way such as stories or clear answers. Studies focusing on memory recall and accuracy noted participants often have difficulty recalling details of events. However, prompts and cues can be used to improve memory recall (Berney & Blane 1997). Thus, initial questions focused on each respondent's personal history, for example, what age they began surfing, their board type, when do they go surfing, and what first made them interested in surfing. These information were used to understand the social demographics of the expert surfers. Another set of questions focused on social and physical changes to surf conditions and the seascape. The responses to these questions were transcribed after each interview. Transcripts were analyzed using thematic analysis and organized into four main themes; social perceptions, environmental and/or anthropological effects, sense of place, and changes in surf quality. During the course of the interview, participants described their experiences surfing at Honoli'i, changes they have noticed, and perceived surf conditions. They discussed their perceptions of change at the surf site, utilized the diagrams given to illustrate what great, average, and poor surf conditions are perceived to be at Honoli'i, and their idea of whether surf quality has stayed constant since they first began surfing.

Two other parts of the interview focused on asking similar questions utilizing different methods. Utilizing three different methods allowed for analysis of whether the method of inquiry influenced an individual's response. The first part used diagrams such as the one shown below in

figure 1. Different variables which make up surf conditions were illustrated, and participants were asked to comment on each variable in relation to great surf, average surf, and poor surf. The next part of the interview focused on using photographs of different surfing conditions from precise dates and times as shown in figure 2 through 6. These photos were provided by Keith Nehls and Surflife.com with permission. Surf conditions in the photo ranged from flat to overhead wave quality, with factors such as wind, tide, and rain present in each condition. Photographs were both far and close range portraits that allowed respondents to appropriately gauge the surrounding environment. The date and time each photo was taken has been used as markers to allow for comparison with scientific data gathered about conditions. The scientific data was sourced from an earlier study focused on surf conditions at Honoli'i (Puniwai in press).

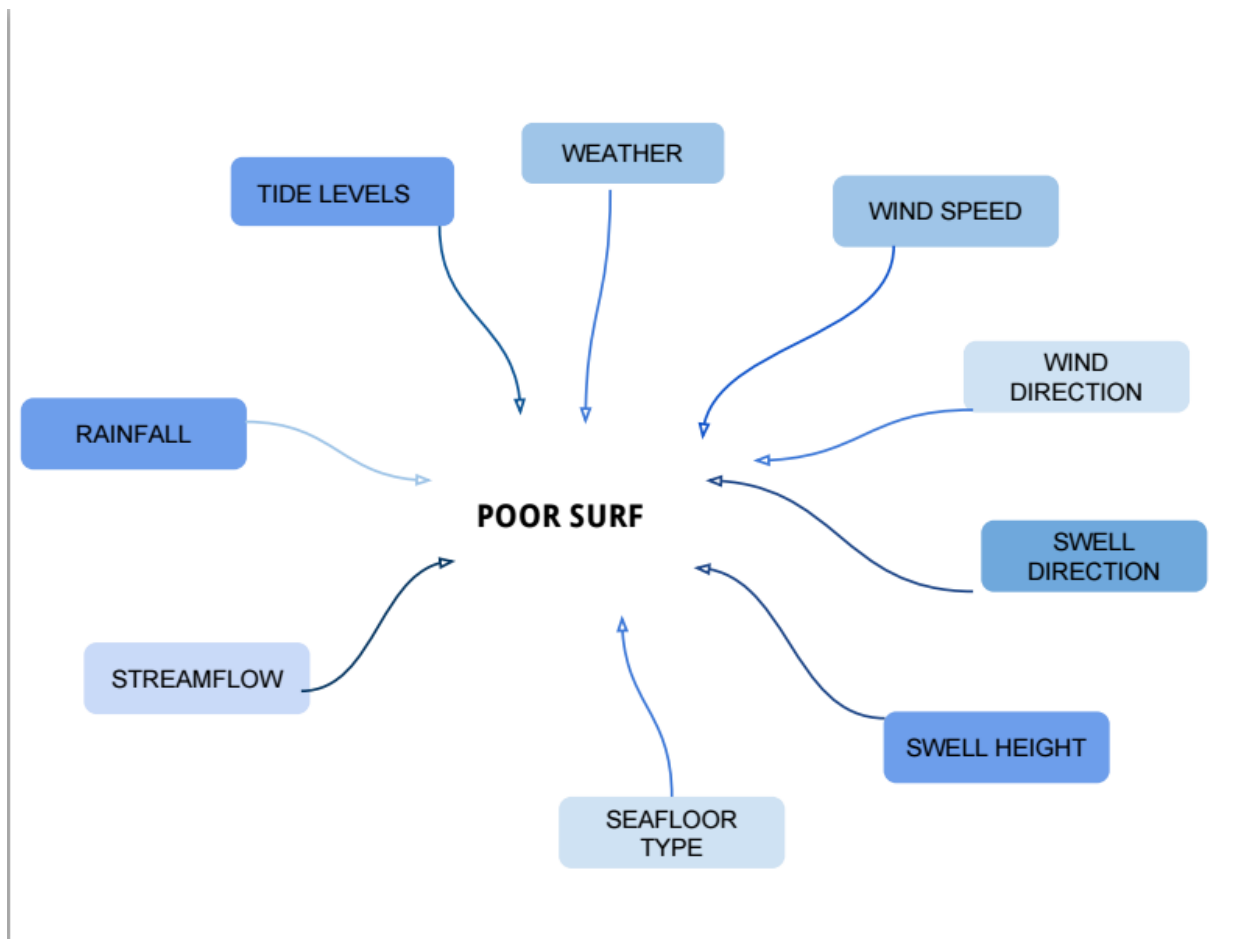


Figure 1: Diagram used for interview showing different variables



Figure 2. Photo 1 of collection shown to participants



Figure 3. Photo 2 of collection shown to participants



Figure 4. Photo 3 of collection shown to participants



Figure 5. Photo 4 of collection shown to participants



Figure 6. Photo 5 of collection shown to participants

Along with diagrams and photos, the interviews included both closed and open-ended questions, allowing for deeper analysis. Interviews were recorded digitally and transcribed. The transcripts were analyzed using thematic analysis, a method used to identify, organize, and report themes within qualitative data (Braun 2006). On analysis of each individual interview, a coding

framework was created. Results and discussions of the framework were structured by main themes that emerged from the transcriptions and diagrams.

The first step taken was rereading notes and listening to the audio recordings from each interview. The audio recordings were transcribed and organized based on key sections of the interview. This stage focused on sorting out important from unimportant material in the text. Part of this sorting involved interpreting stories that hid clues related to the participants answer. For example, a story of a respondent's childhood may seem unconnected to surfing conditions at first, but further exploration can reveal indirect key points that reveal the respondent's character, useful for interpretation.

The next step focused on finding themes by organizing each participant's information to find commonalities. Organizing included finding similarities in answers when looking at each photo of different surfing conditions, similarities in the answers to how frequent the conditions occur at the surf site, and whether there was a connection to social aspects in their personal forecasting of future conditions. Social variables play a role in how respondents view physical surfing conditions, therefore social aspects were qualitatively analyzed. This is based on previous research stating the role social variables have in interpretation of physical surfing conditions (Puniwai unpublished data). For example, looking at a photo of a rainy surf day with 2 foot waves can elicit memory of a special day at the beach with friends and cause a positive response when most would expect those conditions to be average or poor. Using these common themes, I then singled out individual surfing conditions, tide conditions, current direction, wind speed, wave height, and swell height. I planned to compare these human observation-derived data to historical instrument-collected data using statistical analysis.

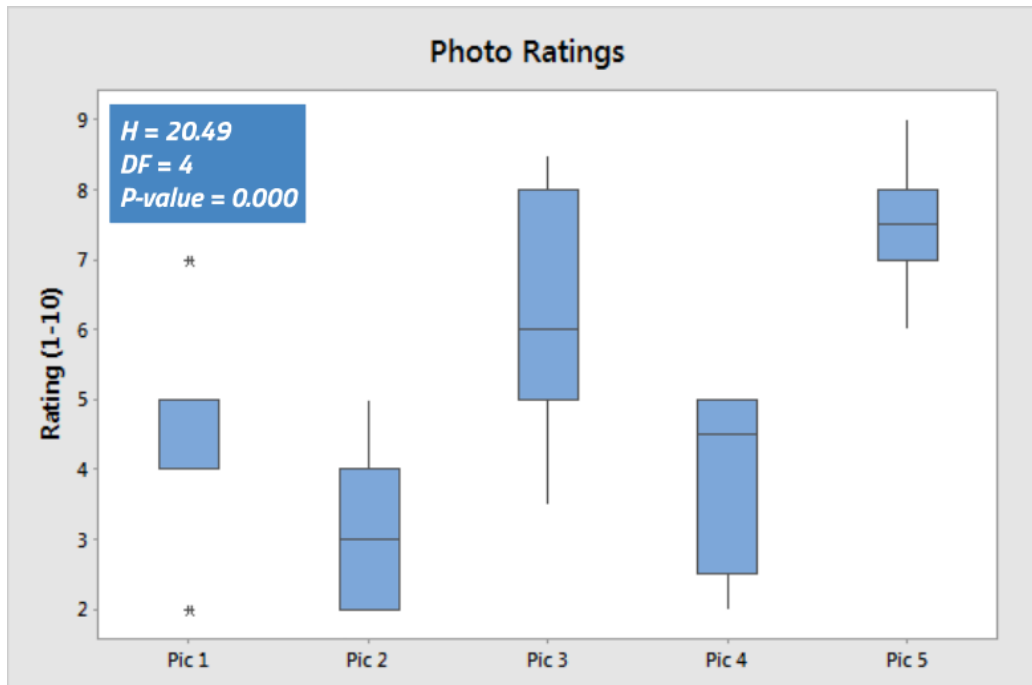
## **Analysis**

### Inability to Compare Human Observation-derived to Meteorological Data

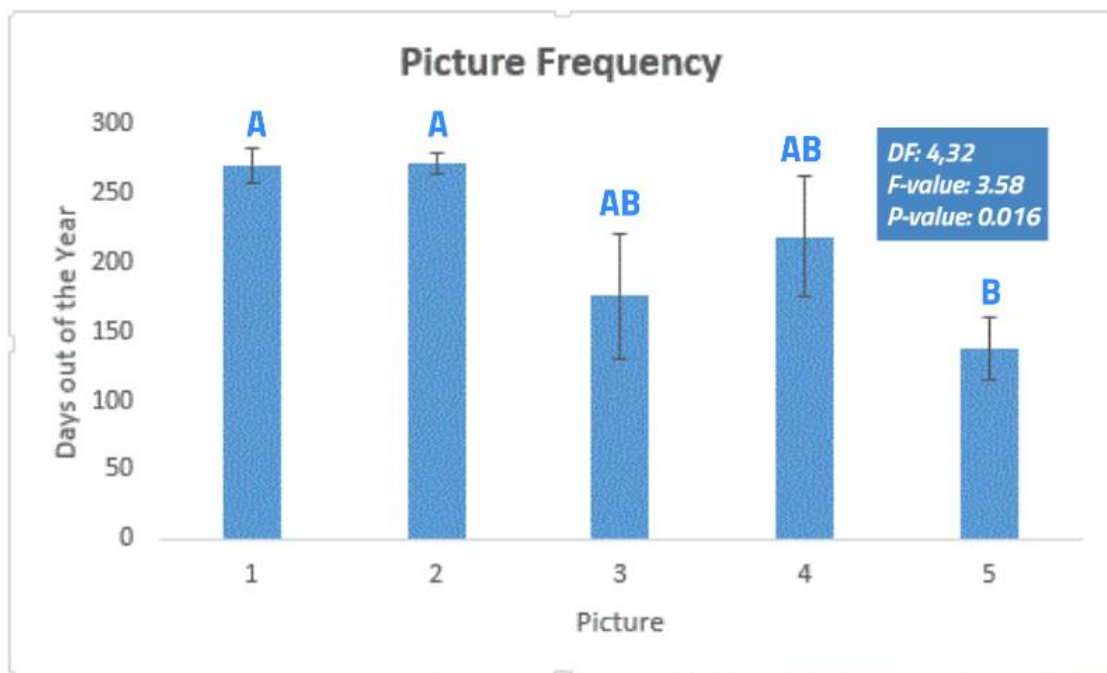
There was insufficient meteorological data to compare the surfer's perception of surf quality to the data obtained from the survey. Each participant had different perspectives on what constitutes surf quality in each photo therefore, answers varied extensively. This led to an inability to compare the variables and statistically analyze whether there is a significant difference between a surfer's perception and meteorological data. For future analysis, suggestions include a time lapse of the surf condition instead of photos. The photos represented a snapshot in time while the meteorological data was hourly data. Having a time lapse would provide participants a clearer picture of the surf conditions and allow for possible analysis.

### Photo Method Analysis

Participants were asked to rate 5 photos, based on surf quality, from 1 through 10, including both wave quality and any variables which they perceived to affect the overall surf. There were variations within ratings when analyzed using a Kruskal-Wallis test ( $P=0.000$ , graph 1). To find whether there is a difference in frequency in each photo based on the surfer's perception, a one-way ANOVA test was run ( $P=0.016$ , graph 2). Pictures 1 through 4 were found to be similar in frequency while pictures 3 through 5 were similar. Pictures 1 and 2 were statistically different from picture 5.



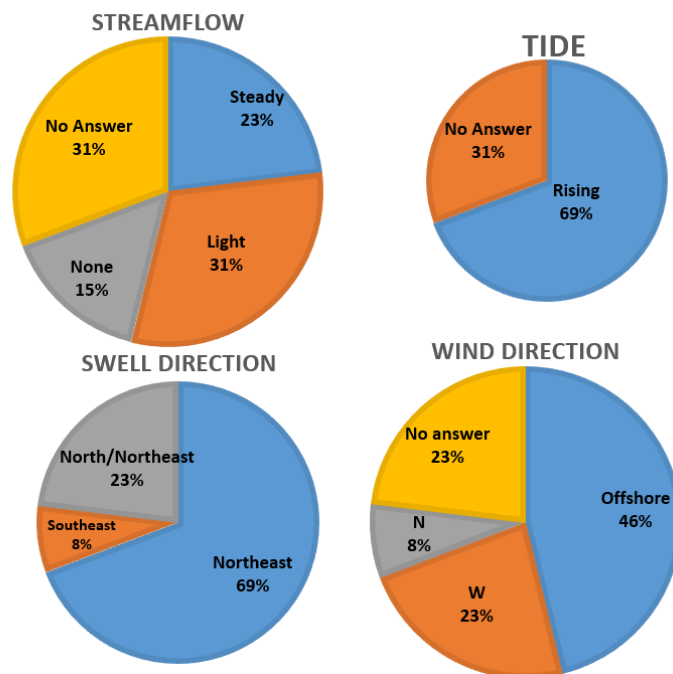
Graph 1. Boxplot of Photo Ratings with Kruskal-Wallis Test



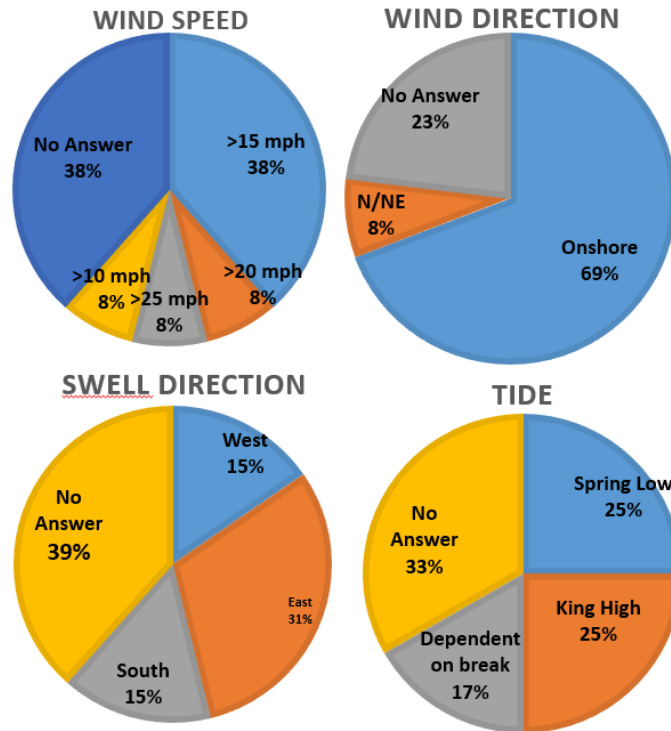
Graph 2. Bar graph showing differences between picture frequency using one-way ANOVA

Diagram Analysis

Diagrams for great surf and poor surf were analyzed using Excel. Responses for how the variables create good and poor surf were put into a table in Excel and formed into pie charts (Graph 3). According to responses overall, great surf conditions include light streamflow, rising tide, Northeast swell direction, Offshore wind direction, 0-5 miles per hour wind speed, no rainfall, and sunny weather. Poor surf conditions in Honoli‘i consist of heavy rainfall, heavy streamflow, king tide, East swell direction, onshore wind direction, over 15 miles per hour wind, and stormy weather (Graph 4).



Graph 3. Four pie charts showing participant responses to great surf diagram



Graph 4. Four pie charts illustrating participant response to poor surf diagram

### Beginning Interview Questions

Most participants have surfed in Hilo for a majority of their lives (MEAN=37 years) with some known as the ‘early morning crew’, who have been surfing at the site for 51 years. Ideal wave height ranged from 4 feet to 8 feet, Hawaiian scale. All participants described their relationship to Honoli‘i using words such as, “roots...watering hole...my backyard...second home.” Each participant confidently described Honoli‘i as a place which they felt a personal relationship to. Participants attributed this to the fact that Honoli‘i is the best and most consistent surf spot on the east side of Hawai‘i Island.

A second set of data from participants were in the form of mana‘o: stories, ideas, and opinions on their perspectives of whether Honoli‘i has changed since they first began surfing and how surfers are socially and physically affected. This local knowledge is vital for future

generations to recognize that Honoli‘i is a landscape which constantly changes not only physically but also socially. These mana‘o which were shared by participants are extremely important in conserving the social history of Honoli‘i because meteorological-based instruments are not able to understand this information. The following sections outline the main themes and subthemes which emerged from thematic analysis of the interviews.

### Social Perceptions

Within the theme of social perceptions, I have identified two sub-themes; changes in the type of people that go to Honoli‘i and the number of people who visit Honoli‘i. Participants noted a larger number of beginner and novice surfers compared to the 1970-90’s, both tourists and college students during the school year. Explanations by participants included increased advertisement of Honoli‘i as one of the best surf spots on the island and an increase in general popularity of the sport. The crowd type has also diversified with more body boarders, stand-up paddlers, and women in the lineup. This observation aligns with the increasing popularity of boogie boarding and stand-up paddling in recent years. The popularity of women in sports such as surfing is well documented and researched. Women struggled to gain acceptance in the surfing culture until the late 1990’s when the professional women’s circuit began to take shape (Booth 2001 pg 17). There were mixed responses to the larger crowd of surfers, with some stating that it was not an issue because they were once novice surfers themselves. Most expert surfers expressed feelings of nostalgia and empathy. However few surfers did state that there was a lack of respect in the water, especially when swells arrived. One noted that this is due to the lack of surf spots available on the east side of the Hawai‘i Island. A comparison between his experience surfing Honoli‘i and spots in Kona concluded that a sense of animosity and tension was felt at Honoli‘i and not in Kona. The mixed responses were followed by personal

experiences in the water; with negative experiences being shared more often than positive experiences. This may be due to having few negative experiences that have stayed in their mentality than the more positive days they experienced.

In addition to a change in the crowd type, participants stated a social change out of the water, with more families at Honoli'i. The majority of surfers perceived a change in the crowd type and crowd number in forms of an increase of novice tourists, college students, women, bodyboarders, and stand-up paddlers. As a result, the act of surfing has been disassociated from the local social context remembered in the 1970's. Older surfers stated a distinct change in the water from when they surfed in their teens. There was a distinct social order in the lineup created to increase safety and reduce collisions; the one who waited the longest gets priority over others (Daskalos 2007). This order has gradually lost ground at Honoli'i due to the newcomers who have become regular surfers. Interestingly, the older surfers surf the early morning session before the younger crowd gets in the water, reducing conflict between the older social order and the new social order established. The old school surfers whom I talked to had gone through the process of recognizing the new social order. However, it was not going to stop them from surfing because surfing was an important part of their lifestyle. The only reason why surfers quit for a period of time was raising a family, an extremely important part of the culture in Hawai'i.

#### Environmental and Anthropological Changes

The constantly changing culture within the surf community has influenced the noticeable change in the landscape of Honoli'i. Participants noted several anthropological changes to the seascape from the 1970 to the 1990s; cliff erosion, change in coastline landscape, disappearance of bagasse, and decreased formation of a sandbar.

Honoli‘i is a perennial stream which is bordered by cliffs, facing east of the ocean. The cliffs align with two surf sites at Honoli‘i, ‘tombstones’ and ‘points’. Half of the participants noted both cliffs has been eroding for as long as they can remember. Participants observed rocks, cement, and lumber falling into the ocean from above into the surf over time. The occurrence of big swells drive the waves onto the rocks and cause the rocks to wash out to sea. All stated that it has not affected the quality of surf, but is a coastal hazard that has not been addressed. More rocks in the shallow area increases the risk of surfers getting harmed while catching a wave in. One participant believes the cliffs are made partially of pahala ash, which has weakened through natural events such as heavy rainfall.

Everyone described the transformation of the coastline, a change which has had social implications for the better. In 2003, a concerned local surfer, Keith “Skibs” Nehls, along with some of the local community decided to take care of Honoli‘i beach park. The movement was motivated through the need to take of their second home, a sense of responsibility and the need to lead by example for future generations. His presence has been described as welcoming by all participants due to its impact to the social landscape. The landscape transformed to what many described as “jungle” to a well-maintained park where families can spend the day watching friends in the water. Some participants described their experience even before the renovation in the 1970s and 80s, when there were no stairs, bathrooms, and lifeguard station. Memories of creating a dirt trail and blindly passing surfboards down the trail were shared.

While all participants noted the cliff erosion and change along the coastline, few were able to describe their experience surfing Honoli‘i during the sugarcane plantation operation. Those who surfed in the 1970’s remembered paddling into the lineup to a sea of bagasse; a dry pulpy residue left over after sugar cane extraction. A report published by the Hawaii Department

of Health notes the input of organic matter of bagasse into Hilo bay before the demise of the sugarcane industry in the 1980s and 90s (Silvius 2005).

### Change in Surf Quality and Variables

The third theme is changes in surf quality and variables which make up surf quality. Through this theme, two sub-themes have been identified. The first is the identification of 2 main variables which surfers observe and believe affect the surf site. The second is the variation in responses by surfers when asked about changes over time in terms of surf quality. The surf community in Honoli‘i can be seen as observers who have a close relationship with the seascape. When asked about any changes in the variables that attribute to forming surf, participants stated the streamflow and tradewinds have the biggest effect on surf quality at Honoli‘i. The streamflow is highly dependent on the rainfall received by Mauna Kea, and flows out from Honoli‘i cove into the surf site. If the streamflow is heavy, sediment is transported from upstream producing a sandbar or sandbed that influences wave formation. The sandbar was described to be found between the surf sites, ‘points’ and ‘mids’ but according to one participant, the river is dependent on where the sandbar is situated. If the sandbar shifts, it leads to a redirection of the streamflow. Those who thought streamflow was the most important factor in surf quality discussed the counteractive effect the flow has towards incoming waves. Heavy streamflow interferes with wave formation leading to softer waves and decreasing wave quality. Many stated a decrease in streamflow for the summer of 2015, with the last recognizable heavy streamflow occurring due to Hurricane Iselle in August 2014. When asked if streamflow positively affects the surf, all participants said steady streamflow creates the best surf conditions. Other participants believed tradewinds were the main variable in forming surf quality in Honoli‘i, with all stating North, Northeast as being the favorable swell direction as well as a

Southeast wraparound. In the early morning and late afternoon, winds are variable or dead, making for little obstruction to swell direction and better quality surf. Both the streamflow and tradewinds were found by participants to be major factors influencing the surf quality in Honoli'i and were able to explain their beliefs through personal experiences.

Surf quality overall was found to be stable for most participants but after further explanation some stated there has been less great surf and more average surf. One response was that there has been less great surf, but when it does come, it seems to be bigger than normally seen. This observation aligns with climate change forecasts of less frequent storms, but more extreme swells.

#### Sense of Place

The last theme discovered through thematic analysis is sense of place. The concept of a sense of place is interpreted in multiple ways (Stedman 2003). Defined by Stedman as a three-component view incorporating (1) the physical environment, (2) human behaviors, (3) social and/or psychological process, a sense of place is a positive emotional bond between people and the environment they inhabit (2003 pp. 671). This bond includes feelings of satisfaction, attachment and meaning. The expert surfers interviewed displayed a sense of place when asked about social and physical changes in Honoli'i. One social event in particular which illustrated the surfers deep attachment to Honoli'i was a proposal for constructing a power plant at Honoli'i during the late 1980's. The surf community rallied along with the Save Our Surf foundation and other concerned citizens to block the proposed power plant over concerns of its effect on the streamflow. Older participants remember this event as one which highlighted the importance of Honoli'i not only as a surf site but a place which has social significance. Feelings of pride were expressed when recollecting the memories of fighting against the proposal.

## Discussion

To answer the question of whether methods of inquiry influenced a person's response, diagrams, open-ended questions, and photos were used as part of the interview. Answers varied extensively between each method therefore I do believe the methods of inquiry influence a person's response. Asking the frequency in which great surf occurred at Honoli'i directly was difficult for participants to answer. However asking the same question with pictures made it easier for participants to respond. Through these methods, we understood that there were no wrong or right answers. Each participant had different responses to the methods used, and no method stood out as being the best method to use for future studies. Using different methods to ensure each participant can express their full mana'o is vital for clear communication between interviewers and those interviewed.

### Quantitative Analysis

A large part of this study focused on evaluating whether a surfer's interpretation of surf conditions align with meteorological data. Based on statistical tests run on the data gathered from photos and diagrams, we concluded that a surfer's perspective varied for both methods. There was difficulty in categorizing and organizing the detailed responses behind why participants chose the variables they did. Therefore, we conclude a surfer's perspective cannot be quantified and compared to meteorological data. However, the stories which were shared can contribute and complement instrument-based data by incorporating a social perspective. The stories shared by participants were variable across all scales, and is important to science and management as meteorological data.

Surfers at Honoli'i have a difficult time explaining the physical changes they have noticed but are able to elaborate more using personal experiences as stories. These stories then

tied in to social changes at Honoli‘i which many participants were able to clearly define. Social and physical changes observed by each participant were interpreted differently, but each interpretation offered new insight. Based on their personal attachment to Honoli‘i, each participant focused using a different perspective. Some participants were stewards of the area, a part of the community effort to keep Honoli‘i family friendly while others were part of the original group who first started surfing at Honoli‘i. The stories and interpretations told were directly tied to each individual’s identity. Taking a person’s personal background into account before conducting similar studies would help explain why responses were different on so many levels.

Participants had difficulty answering questions about how Honoli‘i has changed over time and their idea about what the future holds. Climate forecasts show decreased streamflow, rainflow, and tradewinds for the Honoli‘i surf site for the past 30 years with no change in course for the future (SEAGRANT 2014). According to the results from the diagrams for great surf, participants should have stated a decrease in surf quality. However, participants state the surf quality as being stable and unchanging. The surfers recognize what makes good conditions but do not understand surf quality is actually decreasing. Their perceptions differ from climate forecasts. This is partially due to positive social changes that the surfers take into account when thinking of surf quality in Honoli‘i. Social aspects could not be separated from responses focusing solely on physical changes.

### Qualitative Analysis

The socio-demographics of the participants were similar to Dr. Puniwais survey where surfer experience at Honoli‘i ranged from beginner to expert, yet all surfers noted Honoli‘i as being

their “home spot” (unpublished data). Therefore it can be stated that surfers at Honoli‘i have a close relationship to the place regardless of their experience or their time surfing at Honoli‘i.

The physical changes which surfers noticed included cliff erosion, disappearance of bagasse, decreased formation of a sandbar, and a change in coastline landscape. Many participants noticed several of these changes but may not have been personally affected at their specific surf site and therefore not aware to the full extent of these changes (Stedman 2003). The theory of sense of place is illustrated by this observation and should be explored further to see how individuals react to changes in their landscape. Having a lack of concern for certain parts of the seascape can lead to issues in future conservation of the entire seascape. Recommendations for future study include asking individuals their willingness to pay to manage and conserve the seascape. Participants were also unable to explain reasons behind the cliff erosion. The lack of explanation aligns with the theory that places encompasses not only the physical setting but also human experience and interpretation (Meyer 2010). Future studies can take this observation into account and ask those who surf near the cliff erosion, to gain a better understanding of the reasons behind the erosion. As a community, surfers at Honoli‘i collectively remember different experiences that can be combined to create a larger scale picture representative of the entire seascape. These memories are as important to the coastline transformation as the physical transformation itself because they illustrate how surfers felt attached to the experiences.

The physical change in water quality due to the sugar cane mill closure noted by some surfers and not others represent a shifting baseline in the form of generational amnesia, where knowledge extinction occurs due to younger generations being unaware of past conditions (Papworth 2009). This can have implications for future coastline management in the area if some but not all of the community recognize past management actions that posed a risk to the

seascape. Understanding how past development such as the sugar cane plantation had affected the surf community can lead to improvements towards conservation policy-making or management.

Participants stated streamflow and tradewinds as having the biggest effect on the surf quality at Honoli‘i. The streamflow was described in detail by all surfers. This observation was compared to the survey where question 47 asked how surf quality will be affected by the decreasing streamflow trend. The majority response to the question was that there would be no change in surf. When asked to state why, answers were about the presence of the sandbar and the changing weather patterns. Comparing the two answers, expert surfers seem to be able to better understand the effect streamflow has on surf quality. A follow up question that should be asked is whether they believe surf quality will change if streamflow continued to decrease in the next 10 years. This will allow for better comparison and understanding of whether answers will vary based on experience.

The change in surf quality was asked in two different ways, once directly and another instance with the use of pictures. The use of pictures led to more detailed responses about the frequency of great, average, and poor surf. Their detailed responses were contradictory to their original answers when asked about change in surf quality directly. One reason for this contradiction is having the question asked multiple times, once directly during the question portion of the interview and once more during the photo portion of the interview. After the photo portion, participants were able to explain in detail changes in surf quality more so than when asked directly. The photo may have acted as a possible cue to participants, therefore supporting the idea of utilizing different interview methods in order to strengthen results and analysis.

All participants expressed that they feel a sense of place with Honoli‘i. The surfers have an attachment to the area that is expressed through their willingness to fight when they feel their place is being threatened. It is interesting to note that all surfers acknowledge environmental changes within the seascape as being inevitable and a part of life but understand that they have a presence when it comes to protecting the area from future development. One surfer noted that he did not want any “improvements” to the area, he liked the area just the way it is. Improving the parking lot or adding extra facilities in his opinion would lead to a negative social change and the place would lose its authenticity. His opinion is reflective of Stedman’s description of how satisfaction is one feeling which creates the idea of sense of place (2003 pp. 673). The surfer is satisfied with his sense of place and believes change is unnecessary.

## **Conclusion**

Honoli‘i surfers understand seascapes on a different scale than instrument-based data. Social and physical changes as told through a surfer’s point of view led to a greater understanding of how integrating knowledge from those who have a personal stake in the environment can lead to more resilient communities and ecosystems. Results from this study showcase the complexity of mental models and the difficulty in organizing such models. Forming common themes is a possible solution towards better understanding how to best showcase sociocultural knowledge. In this study, surfers discussed their ability to adapt and act in response to threats to their seascape. Each surfer described their individual observations and experiences to the physical and social changes in Honoli‘i. The individual memories signified pieces of the changes which occurred in the seascape. Altogether, these collective memories provided the full story which tells of the changes from different perspectives. Combining the individual memories together into a collective memory as part of this study illustrated the communities awareness to the

seascape they inhabit. As climate continues to change the physical environment in which people live and socialize, communities such as this one in Honoli‘i have to be recognized for the knowledge they hold. Knowledge is a wealthy resource that is underutilized in today’s understanding of how to conserve fragile seascapes for future generations. Looking back and understanding the actions of stakeholders can increase the resiliency of communities to the impending climate-induced changes.

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